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⑤④ **Waving lotion and method for use thereof.**

⑤⑦ A waving lotion for cold waving, ironing or straightening curly hair is obtained by using an alkali metal salt or ammonium salt of carboxymethylcellulose having a degree of etherification of at least 2.0 as a thickening spreader for the waving lotion. The hair is treated with the waving lotion by a specified method.

The operation can be effectively conducted, since the waving lotion has an excellent storability and satisfactory properties necessitated for various uses, such as viscosity, fluidity, uniform spreadability and affinity for the hair.

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[Field of Industrial Application]

The present invention relates to a waving lotion and a process for using it. In particular, the present invention relates to a new waving lotion developed on the basis of the relationship found by the inventors
 5 between a thickening spreader which is an important additive for the waving lotion and the waving lotions for respective uses and to a process for permanently waving the hair with the lotion.

[Prior Art]

10 Although the mechanism of the permanent waving has not yet been fully elucidated, the cystine bonds (-S-S-) of the hair play an important role. Usually the first lotion (so-called waving lotion) and the second lotion are used for the permanent waving. The first lotion contains thioglycolic acid or its salt or cysteine as a reducing agent in the form of an alkaline solution. Water, the alkali and the reducing agent in the first lotion cut the hydrogen bond, salt bond and cystine bond, respectively, of the hair to soften it. Four
 15 oxidizing agents, i.e. potassium bromate, sodium bromate, sodium perborate and aqueous hydrogen peroxide solution, are usually admitted for the second lotion. Among them, sodium bromate is usually used. After the application of the first lotion, the hair is rinsed with an acidic rinse and the second lotion is applied thereto to regenerate the salt bond by the neutralization of the alkali, to regenerate the cystine bond by the effect of the oxidising agent and to complete a new hydrogen bond as the hair is dried. Thus the intended
 20 waved hair can be obtained.

As for the function and quality required of the first lotion, the reducing power is indispensable and various concomitant conditions are also necessitated. Among them, a thickening spreader exerts a quite important influence thereon. The main purpose of the addition of the thickening spreader is to impart suitable viscosity and spreadability to the first lotion.

25 Ordinary thickening spreaders include cellulose derivatives, polysodium acrylate, polyisobutylene, polyethylene glycol, polyvinyl alcohol, natural pastes, etc. Japanese Patent Laid-Open No. 286312/1986 discloses the use of a carboxymethylcellulose salt having a degree of etherification (hereinafter referred to as "DS") of at least 2.0 as the thickening spreader. However, waving lotions are used in various manners and the necessitated viscosity, function and properties vary depending on the use and manner of use
 30 thereof. Therefore, originality and idea are necessitated in using the thickening spreader depending on the use and manner of use thereof. The Japanese Patent Laid-Open No. 286312/1986 discloses only the use of the carboxymethylcellulose salt having a degree of etherification (hereinafter referred to as "DS") of at least 2 as the thickening spreader.

35 [Summary of the Invention]

Various functions, properties and qualities are required of the thickening spreader of the waving lotion. Although the seriousness of the problems varies depending on the use and method of use thereof, the problems of the waving lotion include the stability of the function and quality over a long period of time,
 40 reducing power, suitable viscosity, preferred fluidity, uniform spreadability, affinity for the hair, high transparency, dispersion stability improving effect, possibility of curling at low temperature, rinsing effect, etc. Easiness of dissolution of the thickening spreader in the course of the production of the waving lotion is also important.

However, no waving lotion satisfying all of the above-described requirements has been obtained in the
 45 prior art.

As for the use of the respective waving lotions, they include those for cold waving and those for permanent waving by ironing. A low viscosity, smooth fluidity, spreadability over the hair and easiness of intermediate washing with water and washing with an acid rinse are particularly required of the former, since the hair is reduced and oxidized in a state wound round a rod. A suitable viscosity and fluidity, affinity for
 50 the hair and curling effect at low temperature are particularly required of the latter, since the hair is thoroughly and uniformly reduced therewith and then curled by ironing. Further as for the waving lotions for straightening curly hair, a high viscosity and adhesion sufficient for forming the bundle of the hairs to prevent curling and thereby to straighten the hair in the step of applying the first lotion are required of them, since the curly hair must be straightened by reduction. In addition, it is required of them that they can be
 55 uniformly spread in an amount larger than that of the above-described other two kinds of the lotions.

After intensive investigations, the inventors have found that waving lotions for cold waving, lotions for waving by ironing and curly hair straightening lotions satisfying all of the above-described requirements can be obtained by using an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at

least 2.0 and controlling the viscosity in a specified range during the use. The present invention has been completed on the basis of this finding.

Thus the present invention provides a waving lotion for cold waving characterized by containing, as a thickening spreaders an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at least 2.0, the viscosity of the lotion during the use being in the range of 3 to 1,000 cps at a liquid temperature of 25°C; a waving lotion for permanent waving by ironing characterized by containing, as a thickening spreader, an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at least 2.0, the viscosity of the lotion during the use being in the range of 700 to 30,000 cps at a liquid temperature of 25°C; a waving lotion for straightening curly hair characterized by containing, as a thickening spreader, an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at least 2.0, the viscosity of the lotion during the use being in the range of 7,000 to 60,000 cps at a liquid temperature of 25°C; and waving processes wherein these waving lotions are used.

The invention provides a waving lotion composition comprising effective amounts of conventional ingredients which may include a reducing agent such as ammonium thioglycolate, sodium thioglycolate and cystain, an alkali such as sodium hydroxide and aqueous ammonium, a wetting agent such as propylene glycol, glycerin, cetyl alcohol and lanolin, a thickener such as carboxymethylcellulose and other additives such as an impregnating agent, a tonic, a colorant, an emulsifier, a perfume and a chelating agent and water, said carboxymethylcellulose being defined above, contained in an effective amount.

It is preferable that the waving lotion composition comprises 1.0 to 7.5 % of the reducing agent, 0.15 to 0.57 % of an alkali, 3.0 to 8.0 % of the wetting agent, 1.0 to 15.0 % of the thickener, small amounts of other additives and 78 to 87 % of water, said carboxymethylcellulose being defined above, contained in an amount of 1.0 to 15.0 %. Percent here is based on weight.

The composition is used as the first liquid for hair dressing. The invention is an improvement of a conventional lotion composition comprising the above shown conventional lotion composition comprising the above shown conventional ingredients, said improvement comprising addition thereto of an effective amount of the above defined salt or ammonium salt of carboxymethylcellulose.

A low viscosity, smooth fluidity, spreadability over the hair and easiness of intermediate washing with water and washing with an acid rinse are particularly required of the waving lotion for cold waving, since the hair is reduced and oxidized in a state wound round a rod. According to the present invention, the waving lotion for cold waving which satisfies all of the above-described requirements can be obtained by adding an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at least 2.0 so that the viscosity of the waving lotion will be 3 to 1,000 cps at a liquid temperature of 25°C and 2.5 to 350 cps at a liquid temperature of 50°C. An example of the methods of cold waving with the waving lotion for cold waving is the so-called rod winding method wherein the hair is wound by using a rod. In this method, the waving lotion is applied to the hair previously wound with water and the hair is left to stand for a processing time of 10 to 15 min. The waving lotion for cold waving according to the present invention can be used in the so-called iron winding method wherein the hair is wound by ironing. In this method, the processing time is 10 to 15 min. The cold waving by the iron winding method has never been conducted heretofore. It has become possible for the first time by using the waving lotion of the present invention.

A suitable viscosity and fluidity, affinity for the hair and curling effect at low temperature are particularly required of the waving lotion for iron waving. According to the present invention, the waving lotion suitable for iron waving can be obtained by adding an alkali metal salt or ammonium salt of carboxymethylcellulose having a DS of at least 2.0 so that the viscosity of the waving lotion will be 700 to 30,000 cps at a liquid temperature of 25°C and 220 to 12,000 cps at a liquid temperature of 50°C. When this waving lotion is used, for example, curling at low temperature is made possible and therefore the hair can be protected from damage by heat, since when the hair is treated with the waving lotion for iron waving of the present invention, the surface temperature of the iron is as low as 80 to 170°C, while it was 180 to 240°C when an ordinary waving lotion was used. The iron waving with the waving lotion for iron waving can be conducted by applying the waving lotion to the hair, adjusting the surface temperature of the iron to 80 to 170°C, preferably 100 to 140°C, and regulating the ironing time to be in the range of 8 to 25 min. Although this waving lotion is originally prepared for the iron waving, it can also be suitably used for straightening curly hair, since an excellent curly hair straightening effect is exhibited when the lotion is applied to the hair and the hair is left to stand for a processing time of 8 to 15 min and then straightened with an iron.

It is important in using the waving lotion for straightening curly hair that a large amount thereof can be uniformly spread on the hair. An ideal lotion is one capable of forming hair bundles to straighten the hair and to prevent curling thereof in the step of applying the first lotion. A waving lotion for straightening curly hair satisfying the above-described conditions can be obtained by controlling the viscosity of the lotion as will be described below by using an alkali metal salt or ammonium salt of carboxymethylcellulose having a

DS of at least 2.0 as the thickening spreader. The viscosity is 7,000 to 60,000 cps when the liquid temperature is 25 °C and 3,200 to 39,000 cps when the liquid temperature is 50 °C. When the waving lotion for straightening curly hair is used, no pretreatment for straightening curly hair is necessary and a waving lotion application time of 8 to 15 min and a processing time of 10 to 15 min are necessitated. Another process for straightening curly hair comprises applying the waving lotion to the hair, leaving the hair to stand for a processing time of 8 to 15 min and straightening the curly hair by ironing at 80 to 170 °C.

The alkali metal salts of carboxymethylcellulose to be used in the waving lotion of the present invention include lithium, potassium and sodium salts thereof, among which the sodium salt produced on an industrial scale is most usually used.

In the present invention, ordinary components of waving lotions other than the thickening spreader can be suitably used depending on the use thereof.

[Examples]

The following Examples will further illustrate the present invention, which by no means limit the present invention.

Examples 1 to 6

Earnest Gum FDM (trade name of ultrahigh-DS sodium salt of carboxymethylcellulose a product of Daicel Chemical Industries, Ltd.) as the thickening spreader in an amount specified in Table 1 was added to a commercially available waving lotion as a stock solution for cold waving to give waving lotions for various uses.

Stock solution: Kadas Beauty Wave N/F two-bath cold waving lotion for bristly hair
 manufacturer: Wella Japan Co., Ltd.
 distributor: Kadas Cosmetics Co., Ltd.

Table 1

		Earnest Gum FDM		Use	Viscosity (cps)
		DS	amount (g)		
Ex.	1	2.30	1.25	cold waving	57
No.	2	2.10	2.50	cold waving	800
	3	2.30	3.75	iron waving	1860
	4	2.10	8.75	iron waving	28500
	5	2.30	6.25	straightening of curly hair	8520
	6	2.10	11.25	straightening of curly hair	52000
Stock solution			0	cold waving	2.8

The amount specified in the Table 1 indicates that of Earnest Gum FDM added to 100 g of the stock solution. The viscosity was determined with a Brookfield viscometer at 25 °C.

The practical value of each of the waving lotions listed in the Table 1 used in various ways was evaluated as will be described below:

1) Evaluation of cold waving:

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to cold wave the hairs of 10 subjects with each of the waving lotions prepared in the Examples 1 and 2.

The results of the evaluation were summarized as follows:

- (1) since the waving lotion has suitable adhesion and affinity for the hair, it did not flow down to the scalp and, therefore, did not damage the scalp,
- (2) since the waving lotion could be uniformly and thickly applied to the hair, the reduction time was reduced by about 20%,

(3) after the completion of the waving, the hair could be quite easily combed and a rinsing effect was recognized, and

(4) the pH, viscosity, transparency, color tone, dispersion state and hair reducing power of the waving lotion of the present invention were unchanged after storage under ordinary conditions (leaving to stand in a closed vessel at ambient temperature without exposure to the sun rays) for two years.

2) Evaluation of iron waving:

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects by iron waving with each of the waving lotions prepared in the Examples 3 and 4.

The results of the evaluation were summarized as follows:

- (1) an effect similar to that of the case of the cold waving was obtained, and
- (2) curling at low temperature was made possible and the curling temperature could be lowered by 70 to 100 °C as compared with the conventional one so that the hair was not damaged at all by heat.

3) Evaluation of straightening of curly hair:

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with each of the waving lotions prepared in the Examples 5 and 6.

The results of the evaluation were summarized as follows:

- (1) although the waving lotion had a high viscosity, it had a suitable fluidity and affinity for the hair and, therefore, it could be uniformly spread in a large amount without forming lumps unlike the ordinary waving lotions,
- (2) since hair bundles were formed to accelerate the straightening when the first lotion was applied, the conditions in the subsequent step were made milder,
- (3) after the completion of the straightening, the, straightened hair was observed to find that it scarcely curled again with time, and
- (4) an excellent storability similar to that described above was recognized.

On the contrary, when the stock solution was used, the absolute amount of the spread solution was insufficient for the completion of the reduction and the object could not be attained, since the viscosity of the solution was insufficient in all the cases.

Example 7 (Evaluation of cold waving: rod winding method)

The cold waving was conducted with each of the waving lotions for the cold waving prepared in the Examples 1 and 2 and specified in the Table 1 by the so-called rod winding method.

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects with each of the waving lotions prepared in the Examples 1 and 2 by the following cold waving method and the results were evaluated.

[Waving method (conditions)]

I. Precare:

- (1) diagnosis of hair: by an ordinary method
- (2) preshampooing: ditto

II.

Selection of hair style: ditto

III.

Precutting: ditto

IV. Water was applied to the hair and the hair was wound round a rod (so-called winding).

V. Application of reducing agent (the first lotion, i.e. waving lotion):

- (1) the first lotion was applied to the hair wound round the rod (the amount of the first lotion used was 80 ml/subject). The processing time for the first lotion was 8 to 15 min,
- (2) after the processing, the hair was washed with slightly warm water to remove the first lotion, and
- (3) the hair was dried with a towel to remove water well from the root to the tip of the hair.

VI. Application of oxidizing agent (the second lotion): by an ordinary method

VII. Rinsing with acid rinse: by an ordinary method

VIII. Aftercutting:

- (1) the hair was cut after the selection of the length and volume of the hair according to the subject's request and taking the volume and direction of the hair stream into consideration, and
- (2) then the hair was further cut freehand and then with the help of a comb while watching the curling state of the hair in order to dress the hair style as a whole.

5 IX.

Hair restoring agent: accordingly to an ordinary method

[Evaluation results]

- 10 (1) Since the waving lotion had suitable adhesion and affinity for hair, it did not flow down to the scalp and, therefore, did not damage the scalp.
- (2) Since the waving lotion could be uniformly and thickly applied to the hair in a large amount, the reduction time was reduced by about 20%.
- (3) The hair was substantially evenly waved irrespective of the quality of the hair or the environment.
- 15 (4) No influence was exerted on the fingers of the beautician or on the scalp of the subject.
- (5) After the completion of the waving, the hair could be quite easily combed and a rinsing effect was recognized.

Comparative Example 1

20

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects by cold waving with a commercially available waving lotion as follows and the results were evaluated.

25 [Waving method (conditions)]

The waving method and conditions were the same as those of the Example 7.

[Evaluation results]

30

- (1) The cold waving was considerably uneven.
- (2) The hair could not be waved due to changes in the quality thereof or the room temperature in some cases.
- (3) The beauticians felt uneasy, since they could not forecast the results of the permanent waving.
- 35 (4) No rinsing effect could be recognized.

Comparative Example 2

40 A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects by cold waving with a commercially available waving lotion as follows and the results were evaluated.

[Waving method (conditions)]

45

I. Precare:

- (1) diagnosis of hair: by an ordinary method
- (2) preshampooing: ditto

II.

Selection of hair style: ditto

50

III.

Precutting: ditto

IV. Application of reducing agent (the first lotion): the hair was wound while 20 to 30 ml of the first lotion was applied thereto and other conditions were the same as those of the conventional process.

V. Winding:

55

- (1) The first lotion was applied to the hair wound round the rod (the amount of the first lotion used being 80 ml/subject). The processing time for the first lotion was 8 to 15 min.
- (2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
- (3) The hair was dried well with a towel to remove water from the root to the tip of the hair.

VI. Application of 50 to 100 ml of the reducing agent (the first lotion) in an ordinary manner

VII. Application of oxidizing agent (the second lotion): by an ordinary method

VIII. Rinsing with acid rinse (treatment): by an ordinary method

IX. Hair restoring agent: according to an ordinary method

- 5 (1) The waving lotion having unsuitable adhesion and no affinity for the hair flow down to the scalp and, therefore, damaged the scalp.
 (2) The processing time could not be reduced, since otherwise the waving of the hair was unsatisfactory. Therefore, any improvement in the productivity by the reduction of the operation time was impossible.
 10 (3) As compared with the Example 7, the reduction time was longer, combing after the completion of the waving was unsmooth and no rinsing effect was recognized.

Example 8 (Evaluation of cold waving: iron winding method)

15 The cold waving was conducted with each of the waving lotions for the cold waving prepared in the Examples 1 and 2 and specified in the Table 1 by the so-called iron winding method.

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects with each of the waving lotions prepared in the Example 1 and 2 by ironing by the following cold waving method and the results were evaluated.

20

[Method (conditions)]

I. Precare:

- 25 (1) diagnosis of hair: by an ordinary method
 (2) preshampooing: ditto

II.

Selection of hair style: ditto

III. Precutting:

- 30 (1) The hair was cut after the selection of the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration.
 (2) Then the hair was further cut freehand and then with the help of a comb while watching the curling state of the hair in order to dress the hair style as a whole.

IV. Drying:

35 The hair was dried to such an extent that it was still a little moist so as to facilitate the application of the first lotion.

V. Application of reducing agent (the first lotion):

- 40 (1) About 40 to 80 ml of the first lotion was uniformly applied to the hair in the range of 3 to 5 mm distant from the scale to the tip of the hair by thoroughly combing the hair crosswise and lengthwise with a jumbo comb in such a manner that the lotion would not adhere to the scalp and then the hair was covered with a cap (processing time for the first lotion: 8 to 15 min at ambient temperature).
 (2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
 (3) The hair was dried well with a towel to remove water from the root to the tip of the hair.
 (4) A treatment oil was uniformly applied thereto so that the ironing would be smooth and easy.

VI. Ironing:

45 The hair was rapidly ironed in 8 to 25 min according to the selected hair style by heating to such a temperature that the hair could be curled which was as low as possible (100 to 170 °C). The heating to a higher temperature or for a longer period of time was to be avoided.

VII. Application of oxidizing agent (the second lotion): by an ordinary method

VIII. Rinsing with acid rinse: by an ordinary method

50 IX. Application of hair restoring agent: by an ordinary method

[Evaluation results]

- 55 (1) Since the waving lotion had suitable adhesion and affinity for hair, it did not flow down to the scalp and, therefore, did not damage the scalp.
 (2) since the waving lotion having a uniform viscosity could be applied to the hair, the reduction time was shortened by about 20% by and, therefore, the operation time could be shortened by 7 to 35 min.
 (3) The hair was curled with an iron after washing away the reducing agent. The hair could be surely

wound with the iron according to the designed hair style and the beautiful permanent waving could be realized.

(4) The hair was not damaged, since the iron winding method could be conducted at a temperature of as low as 80 to 170 °C.

5 (5) No aftercutting was necessary, since the volume, hair-streaming design and curling style had been determined according to the subject's desire.

(6) After the completion of the waving, the hair could be quite easily combed and a rinsing effect was recognized.

10 Comparative Example 3

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects with a commercially available waving lotion by ironing by the following cold waving method and the results were evaluated.

15 [Method (conditions)]

The method and conditions were the same as those of the Example 8.

20 [Evaluation results]

(1) The hair could be hardly waved by the cold waving method.

(2) The hair was wet and could not be beautifully curled with the iron.

25 (3) Even when the hair was curled with the iron under drying at a high temperature, it went out of curl due to water contained in the oxidizing agent.

(4) The hair was thermally stiffened, damaged and became frizzy.

(5) The hair style including the curl, volume and hair stream desired by the subject could not be realized.

Comparative Example 4

30

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to wave the hairs of 10 subjects with a commercially available waving lotion by ironing by the following cold waving method and the results were evaluated.

35 [Method (conditions)]

I. Precare:

(1) diagnosis of hair: by an ordinary method

(2) preshampooing: ditto

40

II.

Selection of hair style: ditto

III.

Precutting: ditto

IV.

45

Application of reducing agent (the first lotion): ditto

V.

Ironing: ditto

VI.

Application of oxidizing agent (the second lotion): ditto

50

VII.

Rinsing with acid rinse (treatment): ditto

VIII.

Application of hair restoring agent: ditto

55 [Evaluation results]

(1) Since the waving lotion had an insufficient adhesion and weak affinity for the hair, it could not be evenly applied to the hair and flowed down to the scalp to damage the scalp.

(2) As compared with the results obtained in the Example 8, the reduction time was longer, combing after the completion of the processing was not smooth and no rinsing effect was recognized.

(3) Even when the hair was curled with the iron under drying at high temperature, it went out of curl due to water contained in the oxidizing agent.

5 (4) The style desired by the subject could not be realizing by the curling.

(5) The hair was thermally stiffened, damaged and became frizzy.

(6) it was impossible to improve the productivity and value added by shortening the operation time.

Example 9 (Evaluation of permanent waving by ironing: iron winding method)

10

A male beautician A (age: 40), a female beautician B (age: 35) and a male beautician C (age: 20) were each asked to wave the hairs of 10 subjects with each of the waving lotion for iron waving prepared in the Examples 3 and 4 by the following iron waving method and the results were evaluated.

15 [Method (conditions)]

I. Precare:

(1) diagnosis of hair: by an ordinary method

(2) preshampooing: ditto

20

II.

Selection of hair style: ditto

III. Precutting:

The hair was cut after the selection of the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration. Then the hair was further cut while suitably setting the volume, stream and curling of the hair in order to dress the hair style as a whole.

25

IV. Application of reducing agent (the first lotion):

(1) About 40 to 80 ml of the first lotion was evenly applied to the hair in the range of 3 to 5 mm distant from the scalp to the tip of the hair by thoroughly combing it crosswise and lengthwise with a jumbo comb in such a manner that the lotion would not adhere to the scalp and then the hair was covered with a cap (processing time for the first lotion: 8 to 15 min at ambient temperature).

30

(2) After the processing, the hair was washed with slightly warm water to remove the first lotion.

(3) The hair was dried well with a towel to remove water from the root to the tip of the hair. No dryer was allowed at all.

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(4) A treatment oil was evenly applied to the hair so that the ironing would be smooth and easy.

V. Ironing:

(1) The hair was rapidly ironed in 10 to 20 min by a technique such as spot winding, whole winding, tip winding or root winding according to the selected hair style by heating to such a temperature that the hair could be curled, which was as low as possible (80 to 170 °C).

40

(2) Not the whole of the hair but the parts of the hair to be curled were ironed.

VI. Application of oxidizing agent (the second lotion): by an ordinary method

VII. Rinsing with acid rinse (treatment): by an ordinary method

VIII. Application of hair restoring agent: by an ordinary method

45 [Evaluation results]

(1) An effect equivalent to that obtained by the cold waving method by ironing in the Example 8 was obtained.

(2) The curling at low temperature was possible. The curling temperature could be lowered by 70 to 100 °C and the hair was not damaged at all by heat.

50

(3) Any design of the hair was possible by free technique and a high creativity could be exhibited without limitation.

(4) Even those yet unskilled in the art can realize an intended hair style.

55 Comparative Example 5

A male beautician A (age: 40), a female beautician B (age: 35) and a male beautician C (age: 20) were each asked to wave the hairs of 10 subjects with a commercially available waving lotion by the following

ironing method and the results were evaluated.

[Method (conditions)]

5 The method and conditions were the same as those of the Example 9.

[Evaluation results]

- 10 (1) Heating was necessitated in the processing.
(2) The ironing took a long time to elongate the operation time by 10 to 50 min as compared with that of the Example 9.
(3) The waving was uneven.
(4) The defects similar to those of the conventional iron waving and punch permanent waving, i.e. the discoloration and denaturation of the hair (such as thermal stiffening), were observed everywhere.
15 (5) The possible varieties of hair design were limited.
(6) Those yet unskilled in the art could not realized an intended hair style.

Comparative Example 6

20 A male beautician A (age: 40), a female beautician B (age: 35) and a male beautician C (age: 20) were each asked to wave the hairs of 10 subjects with a commercially available waving lotion for iron waving by the following ironing method and the results were evaluated.

[Method (conditions)]

25

I. Precare:

- (1) diagnosis of hair: by an ordinary method
(2) preshampooing: ditto

II.

30 Selection of hair style: ditto

III. Precutting:

- (1) The hair was cut after fixing the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration. Then the hair was further cut while suitably setting the volume, direction of stream and curling of the hair in order to dress the hair style as a whole.
35

IV. Application of reducing agent (the first lotion):

- (1) The first lotion in the form of an emulsion or cream was uniformly applied to the hair (from the root to the tip of the hair) with a rough toothed jumbo comb or the like in such a manner that the lotion would not adhere to the scalp and then the hair was covered with a cap (processing time for the first lotion: 7 to 8 min under heating and then 5 to 10 min at ambient temperature).
40 (2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
(3) The hair was dried with a dryer.
(4) A treatment oil was uniformly applied thereto so that the heat would be transferred over the whole hair and the hair would not be damaged.

45 V. Ironing:

An iron with edges and grooves which could be easily heated was used. The hair was strongly curled with the iron at 180 to 240 °C in such a manner that the hair was tensed and stroked.

VI. Application of oxidizing agent (the second lotion): by an ordinary method

VII. Rinsing with acid rinse (treatment): by an ordinary method

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[Evaluation results]

- (1) Since the waving lotion had an insufficient adhesion and no affinity for the hair, it flowed down to the scalp to damage the scalp in some cases.
55 (2) As compared with the results obtained in the Example 9, the reduction time was longer, combing after the completion of the processing was not smooth, and no rinsing effect was recognized.
(3) The thermal denaturation of the hair was observed.
(4) The defects similar to those of the conventional punch permanent waving, i.e. the discoloration and

frizziness of the hair, were observed everywhere.

(5) The possible hair design was limited and therefore the variation thereof was limited in a very small range.

5 Example 10 (Evaluation of straightening of curly hair: iron straightening method)

A male beautician A (age: 40), a female beautician B (age: 35) and a male beautician C (age: 20) were each asked to straighten the curly hairs of 10 subjects with each the waving lotions for iron prepared in the Examples 3 and 4 by the following ironing straightening method and the results were evaluated.

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[Method (conditions)]

I. Precare:

- 15 (1) diagnosis of hair: by an ordinary method
(2) preshampooing: ditto

II.

Selection of hair style: ditto

III. Drying:

20 The hair was half-dried and at the time the fallen hairs were blown away. The hair was dried to such an extent that it was still a little moist so as to facilitate the application of the first solution.

IV. Application of reducing agent (the first lotion):

- 25 (1) About 40 to 80 ml of the first lotion was evenly applied to the hair in the range of 3 to 5 mm distant from the scalp to the tip of the hair by thoroughly combing the hair crosswise and lengthwise with a jumbo comb or the like in such a manner that the lotion would not adhere to the scalp and then the hair was covered with a cap (processing time for the first lotion: 8 to 15 min at ambient temperature).
(2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
(3) The hair was dried well with a towel to remove water from the root to the tip of the hair.
(4) A treatment oil was uniformly applied thereto so that the ironing would be smooth and easy.

30 V. Ironing:

The hair was rapidly ironed in 10 to 30 min according to the selected hair style by heating to such a temperature that the curly hair could be straightened, which was as low as possible (120 to 160 °C). The heating to a higher temperature or for a longer period of time was to be avoided.

VI. Application of oxidizing agent (the second lotion): by an ordinary method

35 VII. Rinsing with acid rinse (treatment): by an ordinary method

VIII. Aftercutting:

- 40 (1) The hair was cut after fixing the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration.
(2) Then the hair was further cut while observing the curling state of the hair in order to dress the hair style as a whole.

IX. Application of hair restoring agent: by an ordinary method

X. Blowing and setting of hair: by an ordinary method

[Evaluation results]

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(1) Since the waving lotion had suitable adhesion and affinity for the hair, it did not flow down to the scalp and, therefore, did not damage the scalp.

50 (2) Since the waving lotion having a stable viscosity could be applied to the hair and it was straightened with an iron, the operation time could be shortened by 20 to 90 min as compared with the conventional method and the reduction time was shortened by about 20%.

(3) After washing to remove the reducing agent, the hair was straightened with an iron. The straightening of the curly hair according to the hair design with an iron was easy and the hair could be beautifully straightened.

55 (4) After straightening the hair by ironing at a temperature of as low as 170 °C, no damage of the hair was observed.

(5) After the completion of the straightening, the hair could be quite easily combed and a rinsing effect was recognized.

Comparative Example 7

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with a commercially available waving lotion for ironing by the following ironing
5 straightening method and the results were evaluated.

[Method (conditions)]

The method and conditions were the same as those of the Example 10.

10 [Evaluation results]

- (1) The state of straightening of the hair was extremely bad.
- (2) Water began to vaporize in the course of ironing.
- 15 (3) Even when the hair was straightened with an iron while the hair was dried at high temperature, the hair went out of curl due to water contained in the oxidizing agent.
- (4) The hair was damaged and became frizzy.
- (5) The straightness of the hair and the style thereof (including the volume and stream of the hair) desired by the subject could not be realized.

20 Example 11 (Evaluation of straightening of curly hair: straightening method)

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with each of the waving lotions for straightening curly hair prepared in the
25 Examples 5 and 6 by the following straightening method and the results were evaluated.

[Method (conditions)]

- I. Precare:
 - 30 (1) diagnosis of hair: by an ordinary method
 - (2) preshampooing: ditto
- II.
 - Selection of hair style: ditto
- III. Application of reducing agent (the first lotion):
 - 35 (1) About 80 to 150 ml of the first lotion in gel form was applied to the hair in the range of 5 to 10 mm distant from the scalp to the tip of the hair by thoroughly combing the hair crosswise and lengthwise with a rough-toothed jumbo comb or the like suitably for the volume of the hair for 8 to 15 min and then the hair was covered with a cap (processing time for the first lotion: 10 to 15 min).
 - (2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
 - 40 (3) The hair was dried with a towel to remove water from the root to the tip of the hair. The use of a hair dryer was not allowed at all.
- IV. Application of oxidizing agent (the second lotion): by an ordinary method for straightening curly hair
- V. Rinsing with acid rinse (treatment): by an ordinary method
- VI. Aftercutting:
 - 45 The hair was cut after fixing the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration. Then the hair was further cut by suitably setting the volume, direction of stream and curling of the hair in order to dress the hair style as a whole.
- VII. Application of hair restoring agent: by an ordinary method
- 50 VIII. Blowing and setting of the hair: by an ordinary method

[Evaluation results]

- (1) Although the waving lotion had a high viscosity, it had a suitable fluidity and affinity for the hair and, therefore, could be evenly spread in a large amount without forming lumps unlike the ordinary waving lotions.
- 55 (2) Since the waving lotion had suitable adhesion and affinity for the hair, it did not flow down to the scalp, and, therefore, did not damage the scalp.

(3) Since hair bundles were formed to accelerate the straightening when the first lotion was applied, the conditions in the subsequent step were made milder.

(4) Since the waving lotion having a stable viscosity could be applied to the hair, the operation time could be shortened by 20 to 90 min as compared with that of the conventional straightening method and the reduction time was shortened by about 20%.

(5) After the completion of the straightening, the straightened hair was observed to find that it scarcely curled again with time.

(6) After the completion of the straightening, the hair could be quite easily combed and a rinsing effect was recognized.

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Comparative Example 8

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with a commercially available lotion for straightening curly hair by the following method and the results were evaluated.

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[Method (conditions)]

The method and conditions were the same as those of the Example 11.

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[Evaluation results]

(1) The straightening of curly hair was unsatisfactory.

(2) Since the operation time was as long as 150 to 200 min, the productivity was too low.

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(3) The results of the straightening were variable depending on the worker.

Comparative Example 9

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with a commercially available waving lotion for straightening curly hair by the following straightening method and the results were evaluated.

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[Method (conditions)]

I. Precare:

35

(1) diagnosis of hair: by an ordinary method

(2) preshampooing: ditto

II.

Selection of hair style: ditto

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III. Application of reducing agent (the first lotion):

(1) The hair was pretreated by applying a treatment or the first lotion or by treating it so that it would be easily reduced. The hair was heated for 10 to 20 min or it was left to stand for a processing time of 10 to 20 min.

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(2) About 80 to 150 ml (suitably determined depending on the volume of the hair) of the first lotion in creamy form was evenly applied to the hair (from the root to the tip) by thoroughly combing the hair crosswise and lengthwise with a rough-toothed jumbo comb or the like in such a manner that it would not adhere to the scalp and then the hair was covered with a cap (processing time for the first lotion: 10 to 15 min under heating and then 10 to 15 min at ambient temperature).

(3) After the processing, the hair was washed with slightly warm water to remove the first lotion.

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(4) The hair was dried well with a towel to remove water from the root to the tip of the hair. The use of a hair dryer was not allowed at all.

IV. Application or oxidizing agent (the second lotion):

The second lotion in creamy form was applied to the reduced hair and the straightened hair was left to stand for a processing time of 10 to 20 min.

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V. Rinsing with acid rinse (treatment): by an ordinary method

VI. Aftercutting:

The hair was out after fixing the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration. Then the hair was further cut by

suitably setting the volume, direction of stream and curling of the hair in order to dress the hair style as a whole.

[Evaluation results]

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- (1) The hair became curly again in a considerable number of the subjects.
- (2) The hair became frizzy.
- (3) Since an operation time of 2 to 3.5 h was taken, the productivity was not improved. The subjects got tired.

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Example 12 (Evaluation of straightening of curly hair: iron straightening method)

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with each of the waving lotions prepared in the Examples 5 and 6 by the following iron straightening method and the results were evaluated.

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[Method (conditions)]

I. Precare:

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- (1) diagnosis of hair: by an ordinary method
- (2) preshampooing; ditto

II.

Selection of hair style: ditto

III. Drying:

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The hair was dried to such an extent that it was still a little moist so as to facilitate the application of the first lotion.

IV. Application of reducing agent (the first lotion):

30

- (1) About 50 to 100 ml/subject of the first lotion was applied to the hair (processing time for the first lotion: 8 to 15 min).
- (2) After the processing, the hair was washed with slightly warm water to remove the first lotion.
- (3) The hair was dried well with a towel to remove water from the root to the tip of the hair.
- (4) Application of treatment oil: A treatment oil was uniformly applied to the hair so that the ironing would be smooth and easy.

V. Ironing:

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The hair was rapidly ironed in 10 to 30 min according to the selected hair style by heating to such a temperature that the curly hair could be straightened, which was as low as possible (130 to 160 °C). The heating to a higher temperature or for a long period of time was to be avoided.

VI. Application of oxidizing agent (the second lotion): by an ordinary method for straightening curly hair

VII. Rinsing with acid rinse (treatment): by an ordinary method

40

VIII. Aftercutting:

- (1) The hair was cut after fixing the length and volume of the hair according to the subject's request and taking the volume and direction of stream of the hair into consideration.
- (2) Then the hair was further cut while observing the curling state of the hair in order to dress the hair style as a whole.

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IX. Application of hair restoring agent: by an ordinary method

[Evaluation results]

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- (1) Since the waving lotion had suitable adhesion and affinity for the hair, it did not flow down to the scalp and, therefore, did not damage the scalp.
- (2) Although the waving lotion had a high viscosity, it had a suitable fluidity and affinity for the hair and, therefore, it could be uniformly spread in a large amount without forming lumps unlike the ordinary waving lotions.
- (3) Since hair bundles were formed to accelerate the straightening when the first lotion was applied, the conditions in the subsequent step were made milder.
- (4) After the completion of the operation, the straightened hair was observed to find that it scarcely curled again with time.
- (5) Since the waving lotion having a stable viscosity was applied to the hair and the hair was straightened

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by ironing, the operation time could be shortened by 20 to 90 min as compared with that of the conventional straightening method and the reduction time was shortened by about 20%.

(6) After washing to remove the reducing agent, the hair was straightened with an iron. The curly hair could be surely straightened according to the hair design with the iron and the straightened hair was beautiful.

(7) Since the hair could be straightened by ironing at a temperature of as low as 80 to 170 °C, the hair was not damaged.

(8) After the completion of the straightening, the hair could be quite easily combed and a rinsing effect was recognized.

Comparative Example 10

A male beautician A (age: 40) and a female beautician B (age: 35) were each asked to straighten the curly hairs of 10 subjects with a commercially available waving lotion for straightening curly hair by the following iron straightening method and the results were evaluated.

[Method (conditions)]

The method and conditions were the same as those of the Example 10.

[Evaluation results]

(1) The hair was occasionally damaged or broken.

(2) Water contained in the hair began to vaporize in the course of ironing.

(3) Even when the hair was straightened with an iron while the hair was dried, the hair was curled again due to water contained in the oxidizing agent.

(4) The hair was damaged and became frizzy.

(5) The straightness of the hair and the style thereof (including the volume and stream of the hair) desired by the subject could not be realized.

The following effects of the waving lotion of the present invention were recognized:

(1) the quality of the waving lotion can be kept over a long period of time.

(2) the availability of the first lotion is improved.

(3) the operation time can be shortened, so that it is possible to improve the productivity and the availability of the worker.

(4) The treatment temperature is lowered, so that the hair can be protected from thermal damage.

(5) Rinsing effect can be obtained and smooth combing becomes possible.

The waving lotion of the present invention has various properties required of the cold waving, ironing and straightening of curly hair. The process wherein the waving lotion of the present invention is used is far superior to the conventional processes. The effects of the waving lotion of the present invention can be summarized as follows according to the use thereof:

(1) Cold waving:

The worker can precisely plan the operation depending on the intended curling state of the hair, the intended results of cold waving can be obtained irrespective of the quality of the hair and difference of the environment.

By using the waving lotion of the present invention, the cold waving technique by iron winding which has been impossible in the prior art becomes possible.

(2) Ironing:

Since the hair can be ironed at a temperature of as low as 80 to 170 °C, the hair can be curled while the water content in the hair is kept unchanged. Therefore, the hair does not go out of curl due to Water contained in the second lotion, since curling is conducted at low temperature while the water content is kept unchanged. Namely, the worker can curl the hair to realize an intended hair style. Further since the operation is thus made easy, those unskilled in the art can yield the results which are substantially equivalent to those yielded by the skilled ones. The ironing time which has been 25 to 50 min heretofore can be remarkably shortened to 8 to 25 min by the operation process of the present invention to improve the productivity and service for the customer.

(3) Straightening of curly hair:

The complicated process necessitating a long time can be simplified and only an operation according to the principle of cold waving is required. Therefore, the object, the straightening of curly hair,

can be attained by the simple operation in a short period of time.

Claims

- 5 1. A waving lotion for cold waving characterized by containing, as a thickening spreader, an alkali metal salt or ammonium salt of carboxymethylcellulose having a degree of etherification of at least 2.0, the viscosity of the lotion during the use being in the range of 3 to 1,000 cps at a liquid temperature of 25° C.
- 10 2. A process for cold waving by the rod winding method, characterized in that the waving lotion set forth in Claim 1 is applied to the hair previously wound with water and the hair is left to stand for a processing time of 8 to 15 min.
- 15 3. A process for cold waving characterized in that the waving lotion set forth in Claim 1 is applied to the hair and the hair is left to stand for a processing time of 8 to 15 min and is curled by ironing.
- 20 4. A waving lotion for permanent waving by ironing characterized by containing, as a thickening spreader, an alkali metal salt or ammonium salt of carboxymethylcellulose having a degree of etherification of at least 2.0, the viscosity of the lotion during the use being in the range of 700 to 30,000 cps at a liquid temperature of 25° C.
5. A process for permanent waving by ironing characterized in that the waving lotion set forth in Claim 4 is applied to the hair and the hair is ironed at an iron surface temperature of 80 to 170° C for 8 to 25 min.
- 25 6. A process for straightening curly hair characterized in that the waving lotion set forth in Claim 4 is applied to the hair and the hair is left to stand for a processing time of 8 to 15 min and then straightened by ironing.
- 30 7. A waving lotion for straightening curly hair characterized by containing, as a thickening spreader, an alkali metal salt or ammonium salt of carboxymethylcellulose having a degree of etherification of at least 2.0, the viscosity of the lotion during the use being in the range of 7,000 to 60,000 cps at a liquid temperature of 25° C.
- 35 8. A process for straightening curly hair characterized in that the waving lotion set forth in Claim 7 is applied to the hair for 8 to 15 min and the hair is left to stand for a processing time of 10 to 15 min without any pretreatment for straightening the curly hair.
- 40 9. A process for straightening curly hair characterized in that the waving lotion set forth in Claim 7 is applied to the hair and the hair is left to stand for a processing time of 8 to 15 min and then straightened by ironing.

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EUROPEAN SEARCH REPORT

Application Number

EP 91 11 9968

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 5)
D,Y	DE-A-3 618 497 (DAICEL CHEMICAL INDUSTRIES LTD) * Whole document * & JP-A-61 286 312 ---	1	A 61 K 7/06 A 61 K 7/09
Y	EP-A-0 085 894 (MERCK PATENT GESELLSCHAFT) * Example 5 * ---	1	
A	PATENT ABSTRACTS OF JAPAN, vol. 10, no. 362 (C-389)[2419], 4th December 1986; & JP-A-61 158 911 (DAICEL CHEM. IND., LTD) 18-07-1986 * Abstract * ---	1	
A	GB-A-2 116 218 (WELLA AG) * Page 1, lines 1-31; claim 1 * ---	1,2	
A	GB-A-2 185 269 (THE GILLETTE CO.) * Claims 11,12,17 * ---	1,7,8	
A	US-A-4 299 817 (R.B. HANNAN) * Column 4, lines 15-23; example I * ---	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	EP-A-0 377 836 (HELENE CURTIS INC.) * Page 7, lines 31-51; page 10, lines 45-50; example 1; claims 1,9,11 * -----	1,2	A 61 K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13-01-1992	Examiner COUCKUYT P.J.R.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			